only "inductive" effort in the book. The chapter contains a large number of moderately well-sifted facts. The author's *questionnaire* included 1658 persons of various ages and races. Some of the facts are valuable, but they are not so arranged as to elicit any striking generality. They are, indeed, like the "facts" of many other *questionnaires*, apt to be the bad observations of untrained observers. The minute study of a few cases would have been more fruitful of "inductions" than these somewhat content-less percentages of commonplace recollections. One reasonably looks for more from an "inductive" study than this on the question of "taking notes":—"There is a wide diversity of opinion as to how full notes a student should take, and almost all degrees of copiousness are indicated" (p. 270). The true inference is that most students are poor psychologists. The extremely varied suggestions for teaching a "boy to remember things *on time*" (p. 271) only show that practical pedagogy in America, as elsewhere, is more ready to punish the boy than to study his mind—punishment being as effective, on the average, as it is useless in some particular cases.

Chapter vii.—"Apperception and Association"—includes sections on recognition times, attention and interest. This chapter is one of the best in the book. The essence of Chapter viii.—"Pedagogical Applications"—is that good memory depends on attention and the attentive multiplication of associations. There is not much novelty.

Of the book as a whole, it must be said that it suffers, in every chapter, from a want of clear definition of terms and a clear analysis of the phenomena to be investigated. The references, however, are valuable and the bibliography is good.

W. LESLIE MACKENZIE.

A LUNAR ROMANCE.

The First Men in the Moon. By H. G. Wells. Pp. 312. (London: George Newnes, 1901.) Price 6*s*.

IT is many years now since Jules Verne wrote his imaginary account of a journey to the moon. He supposed a party of three men enclosed in a projectile shot by a huge gun towards the moon, which they never reached; they fell back to earth and escaped in a marvellous manner to tell the tale. The work was imaginative enough to hold the attention, but full of scientific blunders and improbabilities of the most glaring character. Mr. Wells has produced a book of a very different character; he has made himself master of the little we know about the moon, and thought out the possibilities with the greatest care, and the result is a narrative which we will venture to say is not only as exciting to the average reader as Jules Verne's, but is full of interest to the scientific man. We do not mean that the astronomer is likely to learn any new facts from this *résumé*, for which he himself furnished the material; but he will be astonished to find how different the few scientific facts with which he is familiar look in the dress in which a skilful and imaginative writer can clothe them, and it is worth reading the book with minute care to see if one cannot catch Mr. Wells in any little scientific slip. Some writers are so easy to catch that the game is not worth playing; but Mr. Wells is a worthy opponent, and we are glad to see that his scientific rank has been recognised by the Royal Institution, who have invited him to lecture on January 24.

The visit to the moon is made possible by the discovery of a substance (cavorite) impervious to gravitation. This interesting property comes to cavorite only at a critical temperature (60° F.), after "the paste has been heated to a dull red glow in a stream of helium," and the suddenness with which the imperviousness arrives causes interesting events at first. When the new conditions are better realised, a glass sphere is built and covered with cavorite blinds which can be put up or down. When all are down the sphere is entirely free from attraction, and when any particular blind is up it is only attracted by the stars or planets seen in that direction. It is obvious that in these circumstances a comfortable voyage through space is manageable. The two occupants of the sphere journey to the moon and land upon it near the terminator, on a snow drift of frozen air. With sunrise they find that the air melts and evaporates, and there is enough for them to breathe, so that they emerge from the sphere. They find their weight a trivial matter and leap twenty or thirty yards at a step, and a wonderful fungus vegetation springs up before their eyes. In the exhilaration of exploring they lose their sphere and are thus thrown on their own resources. Presently they come across the Selenites, who emerge from the interior of the moon, where they have been spending the lunar night. The first to emerge are those herding the moon calves—great beasts 200 feet long, that browse in a vividly described and rather disgusting manner ("like stupendous slugs") on a speckled green mossy plant. The cowherd was a "mere ant" by comparison, and the intelligent Selenites generally turn out to be a sort of insect, varied physically in a grotesque manner at will. After various adventures in and on the moon, one of the voyagers recovers the sphere and gets back to earth; the other stays in the moon and sends messages by ethereal telegraphy describing it more fully; and the interest never flags throughout. Following similar writings, Mr. Wells sometimes allows himself a sly hint at terrestrial matters in describing lunar affairs. He describes a lunar artist thus (p. 302):—

> "Love draw. No other thing. Hate all who not draw like him. Angry. Hate all who draw like him better. Hate most people. Hate all who not think all world for to draw."

And two pages on there is a similar burlesque description of a mathematician. It is even easier to see the point than to find the pun in the following:—

> "And since the density of the moon is only three-fifths that of the earth, there can be nothing for it but that she is hollowed out by a great system of caverns. There was no necessity, said Sir Jabez Flap, F.R.S., that most entertaining exponent of the facetious side of the stars, that we should ever have gone to the moon to find out such easy inferences, and points the pun with an allusion to Gruyère . . ."

Of a book so full of unfamiliar things it is impossible to give a complete account. We will conclude this notice by heartily recommending the book to readers both scientific and unscientific, and by giving, with a triumph

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not free from trepidation, an instance where we think Mr. Wells has been caught napping. When the cavorite blinds are closed and the sphere starts on its journey, he describes the curious effects of the absence of external gravitational attraction—all the material occupants of the sphere slowly collect in the interior by their *mutual* attractions, and there is no "up" or "down." Then a window is opened towards the moon and promptly everything gravitates towards the moon—the direction towards the moon is *down*wards, though the attraction is slight. Surely this is a slip? With bodies moving freely in space only the *differential* attraction would be felt, and this would be negligible compared with the mutual attraction of the occupants of the sphere. Even if it were not so small it could not act in the manner specified; its tendency would be to *separate* bodies (as in the case of the tides), not to bring them together, and thus a man near a "floor" would not fall towards it but would rise from it. But Mr. Wells is so wonderfully careful in general that we make this criticism with far less confidence than we should have felt in another case; we have an uneasy feeling that he may dexterously transfer the supposed slip from his account to ours.

A POPULAR WORK ON FISHES.

The Story of Fish Life. By W. P. Pycraft. Pp. 210. (London: G. Newnes, Ltd., 1901.) Price 1s.

THIS book, which is one of the shilling series published by Messrs. Newnes, is divided into fourteen chapters and illustrated by seventeen text figures and a frontispiece. Its contents are generally interesting and well arranged, but there is recognisable throughout its pages a leaning towards the racy and sensationally attractive, as, for example, in the method of dealing with the habits of the sword-fish and the feeding process generally. The mode of treatment is mainly physiological, the consideration of function preponderating over that of structure and development. Migration and "transformation" are in turn dealt with, the latter with a commendable emphasis of the part played in Nature's operations by "substitution."

Much attention is given to the skeletal organs and especially the teeth, and the author loses no opportunity of forcing home the lesson of the tooth-scale homology. The effort, however, is somewhat weakened by the assertion that, while fish-scales are (p. 29) typically "horny plates," they are (p. 31) in "the most primitive form" bony. The statement that the bony fin supports (p. 68) have been formed by the fusion of clusters of original "hair-like" rays is equally misleading; and in dealing with the terms expressive of types of tails, the author falls into the prevailing fallacy of applying them to the fins and not to the fishes themselves. In declaring that in the typical fish the dorsal fins are two in number, the fact that there may be three dorsals is ignored, it being implied (p. 58) that the codfish has but two. And error is further evident in the assertion that the adipose fin is "without supporting structures."

The mode of description is in places none too well chosen. Such declarations as that the "beauty" of the Cestracion's teeth is "entirely an accidental feature" and that in deglutition the "touch" of the swallowed food "signals" through the closed-up gullet to the nerves, are to be deprecated in a book of this kind; while a greater regard for the facts of morphology would have been in places acceptable, as in the mode of treatment of the types of so-called external gills. The existence of these in the Teleostei is denied; but while we excuse the non-allusion to those said to occur in the loaches, we consider it strange that, on a later page, the author incidentally refers to the African fishes obtained by Budgett, in which they have been proved to be abundantly present, without mentioning them. Nor is he more fortunate with his treatment of the internal gills and respiration, for nowhere in the book are the numerical limitations of the former even stated, nor is there mention of the "breathing valves," to which attention has but recently been redrawn.

In the aforenamed and other equally important matters, which, under the scheme adopted, should have found recognition in the book, the author is not up to date, as, for example, in his declaration that nothing is known of the chimæroid development. In the organological sections of the book sufficient use is never made of extremes of modification, such, for example, as those which render clear the real differences in the composition of the gills of the bony fishes and elasmobranchs, expressed in the terms pectino- and cysto-branchiæ. Particularly is this the case with the alleged distinctions between the two chief groups into which the author would divide the fishes as a whole. He gives, for this purpose, a classification, which is neither that of the author to whom he ascribes it nor an accurate statement of Huxley's observations, upon which it is based. "Hyostylic" and "autostylic" are the terms which denote the distinctive characters of his two great "branches," but the former is wrongly construed. Neither the author of the present work nor he whom he names acknowledge the condition termed by Huxley the *amphistylic*; and the author himself does not even mention the Notidanidæ, of which, alone among living fishes, it is diagnostic. These and the Port Jackson shark (which exhibits a marvellously transitional condition of the parts in question, for which alone a distinctive term might well be introduced) are not typically hyostylic. They are lower than those fishes which are. Without recognition of them and the amphistylic state Huxley's system cannot be adequately set forth. So important is this morphologically that advantage might be gained by associating the Notidanidæ with at least the Hydodonts and Pleuracanths among fossil forms, in a distinct order, in preference to the retention of the name "Ichthyotomi" for the latter alone. In the present case, in the non-recognition of these amphistylic forms and the absence of all reference to the hyomandibular element, the essential point is lost. In the spread of scientific knowledge, the more elementary that imparted the more precise should be the diagnoses employed.

There is a closing chapter on palæichthyology, of a very cursory type.

The present book is the second which the author has contributed to the series to which it belongs. The first, on "The Story of Bird Life," was in every way a success and as a popular treatise exemplary. Comparison shows that the striking differences between the two books are due to the fact that with the first of them alone the

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